Diesel Engine Retrofit Technology Verification

Evelyn Hartzell
Environmental Engineer
U.S. EPA Office of Research and Development (ORD), National Risk Management Research Laboratory (NRMRL)
Environmental Technology Verification (ETV) Program
(513) 569-7728
hartzell.evelyn@epa.gov

Authors: Evelyn Hartzell
U.S. EPA ORD, NRMRL, ETV Program
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Environmental Issue

According to recent estimates, there are approximately 7.9 million heavy-duty diesel trucks and buses in use in the United States. Emissions from these vehicles account for substantial portions of the country's ambient particulate matter (PM) and nitrogen oxide (NOx) levels and have contributed to the non-attainment of National Ambient Air Quality Standards (NAAQS) in several areas of the country. These pollutants also contribute to serious public health and environmental problems, including premature mortality and reduced visibility. Also, PM from diesel engines is likely a carcinogen.

Scientific Approach

In response to these concerns, the ETV Program verified the performance of six diesel engine retrofit technologies in 2003 and 2004. These technologies were designed to reduce particulate matter (PM) emissions from heavy-duty diesel trucks and buses, although associated hydrocarbon (HC) and carbon monoxide (CO) reductions were also achieved. Decision-makers within the environmental industry need independent, high-quality data to evaluate the performance of these technologies and potential emission reductions associated with their use.

Partnerships

The ETV protocols used to verify the technologies were developed with the U.S. Environmental Protection Agency (U.S. EPA) Office of Transportation and Air Quality's (OTAQ) participation as a stakeholder. These protocols were eventually posted on the Voluntary Diesel Retrofit Program (VDRP) Web site and can be used by retrofit technology manufacturers to demonstrate the emission reduction performance necessary for inclusion on the VDRP Verified Technology List. In fact, although other information outside the scope of the ETV protocols may be required to satisfy OTAQ requirements, a number of ETV-verified vendors supplied ETV data to OTAQ, and their technologies are now listed in the VDRP list. Thus, the relationship between ETV and OTAQ has led to the development of well accepted protocols and also reduced the amount of testing needed to demonstrate emission reduction performance [e.g., to fulfill State Implementation Plan (SIP) requirements].

Impact

During ETV testing, emission reductions ranged from 21% to 95% for PM, 37% to 100% for HC, and 12% to 87% for CO, relative to the performance of the same baseline engines without the technologies in place. Based on preliminary estimates, between 451 to 4,180 incidences of premature mortality could potentially be avoided if 10% of the existing fleet of heavy-duty diesel trucks and buses utilize one of these retrofit technologies for seven years, based on a comparison to projected impacts associated within PM reductions attributed to the 2007 Heavy-Duty Highway Final Rule. Diesel retrofit technologies can also be used to help states and communities meet NAAQSs and fulfill SIP requirements.